is to the indomitable perseverance of a French savant, Boucher de Perthes, that we have seen this proposition become established in science; if it is to the regretted Thompsen and other savants of Scandinavia that we owe the first attempts of a classification of these times forgotten by history; it is a Belgian, Schmerling, who has definitely demonstrated, and placed beyond controversy, the proposition of our geologists of central France. In 1834 he showed that in the caverns of the province of Liége there existed some very ancient land slides which had recovered some palæontological beds with human bones, these having been thus removed from all subsequent handling, so as to place the contemporaneity of the débris they contained beyond all doubt.

MICROSCOPY.

Classification of Microscopic Objects.— Dr. James Murie, of Middlesex Hospital, England, has contributed two elaborate papers on this subject to the Royal Microscopical Society.

In the arrangement of objects in a microscopical cabinet he adopts the following excellent rules, which are equally applicable to any system of classification. 1. Do not needlessly multiply similar specimens. 2. Do not, on feeble grounds, separate naturally allied objects. 3. Maintain, as far as possible, a uniform style of nomenclature and size of slide. 4. Endeavor to place in the cabinet good typical specimens well prepared. 5. Reject all lumber, which only weakens a collection.

In arranging objects belonging to the organized kingdoms, it is customary to begin with a series of elementary tissues, either preceding the main collection with this, or developing it from this. Thus advise the writers on histology, and thus are arranged the great histological collections. Such a classification, which may be advisable in collections (as in books) used for teaching the elements of histology, and in small private collections where little more than types of the different kinds of cells are present, is unnecessary in large collections designed for consultation and reference by those who are somewhat familiar with the primary elements, and undesirable from causing an unnecessary duplication of specimens and from marring the general harmony and sequence of the grouping. The elementary tissues can generally be conveniently arranged along with the organs they help to build up; or, at most,

each natural kingdom may be preceded by a few typical slides illustrating, not exhaustively, the material of which it is built.

In the mineral kingdom, micro-chemicals precede micro-minerals, but there seems to be no gradation of minute forms upon which a classification could rest. The systems employed in the text-books may therefore be followed. Polarizing objects form a convenient subsection. Several specimens of the same substance may be arranged geographically. There should be no microscopical geology, but its subjects should be scattered through the general collection according to their biological relationships. To every natural division should be appended a series illustrating its application to the arts and manufactures, showing its utility, purity, adulterations, etc.

In the vegetable kingdom the natural orders should, as far as possible, regulate the general arrangement, while the subsidiary divisions should be of a physiological character. Often the lower organisms can be viewed in their completeness in a single slide, while the higher can only be illustrated by a succession of subseries. The lower forms, almost up to the ferns, should be primarily grouped according to their genetic affinities, the subdivisions being physiological. The higher forms, however, monocotyledons and dicotyledons, should be primarily divided physiologically, according to organs and apparatus, the secondary divisions being dependent on genera, families, etc. Thus the roots, stems, flowers, etc., must be grouped together and not separated that each genus may be separately illustrated. Fossil forms should be placed with the rest. Specimens of unknown affinities may be arranged geologically, geographically or according to their economic value. Teratology should follow physiology. Fabrics, adulterations, etc., should conclude the series.

The animal kingdom should be arranged on the same general principles as the vegetable kingdom.

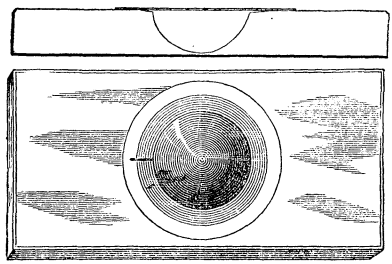
The cabinets for the retention of objects are best made small and in a cubical form so that any number of them may be piled up to form a large cabinet. The slides should lie flat in drawers containing but a single layer. Some of the English opticians sell cabinets of polished deal, which are a cheap and excellent substi tute for the elegant mahogany cabinets ordinarily used. When greater cheapness is required, trays of tin or of pasteboard may be used, piled up in boxes of convenient size according to the plans

of Mr. Henry George and Mr. Piper. The cabinet may be furnished, at the bottom, with some deep drawers for the reception of large objects in deep cells; the heavy objects thus brought together being represented in the classified collection by blank slides properly numbered and labelled, and referring to the drawer in which the object is to be found. Slides not exceeding three inches square are easily arranged in the regular drawers, and if any exceed three inches they should still be placed in their proper position, the partitions being cut away so as to allow them to occupy a double interspace.

A Life Slide.—The accompanying engravings represent front and side views of a form of life slide for the microscope, designed and used with much success by Mr. D. S. Holman. It is constructed to retain the greatest quantity of material under the smallest cover glass, and is designed to be used with the highest powers of the microscope for studying the Bacteria, Vibriones, and other very low forms of life.

The slide consists, as will be seen from the cuts, of a central polished cavity, about which is a similarly polished bevel; and from the bevel outwards extends a small cut, the object of which is to afford an abundance of fresh air to the living beings within, as well as to relieve the pressure, which shortly would become so great, from the evaporation of the liquid within, as to cause the destruction of the cover glass.

Fig. 143.



No special dimensions are stated for the central cavity. The bevel is usually $\frac{1}{8}$ inch in diameter (the cut is $\frac{2}{3}$ of natural size); the small canal is cut through the inner edge of the bevel or annular space, outwards, for the purpose named above.

It is found, upon enclosing the animalculæ, etc., that they will invariably seek the edge of the pool in which they are confined, and the bevelled edge permits the observer to take advantage of this disposition; for when beneath it, the objects are within range of the glasses of high power.

Another very important feature in the device is the fact that a

preparation may be kept within it, for days or weeks together, without losing vitality, owing to the simple arrangement for supplying fresh air.

We have repeatedly had the opportunity of witnessing the use of this slide, and are convinced that nothing of the kind has yet been devised which can equal it in excellence, either for observing or generating the lower forms of life.—*Journal Franklin Institute.*

To Blacken Brass.—The following methods are given by anonymous correspondents in the "English Mechanic and World of Science." Though not new they will be useful to readers, who desire to give a dead-black finish to adapters, diaphragms, etc. Warm the brass over a gas flame or spirit lamp, and plunge it while hot for two or three seconds into nitric acid. Then heat again until it blackens, brush off the blisters, and lacquer if a lustrous surface is desired. Instead of the nitric acid the following fluid may be used: a mixture of two parts of arsenious acid, four parts of hydrochloric acid, one part of sulphuric acid, and eighty parts of water.

Monochromatic Sunlight, by Means of Glass Plates.—Mr. J. Edwards Smith, of Ashtabula, Ohio, has obtained light with which he is perfectly satisfied by means of a light sky-blue and darker green glasses. He prefers to use one blue glass combined with two or three green ones, the best shades being ascertained by trial. Several such sets, of different depths of color, may be mounted in a series, like magic lantern pictures, so that either set can be brought easily over the hole in the shutter. By sunlight transmitted through such a combination of glasses, and without condenser or apparatus of any other kind, he "resolves" all the shells of the Probe Platte with perfect ease. He considers the light thus modified as good as the more nearly monochromatic light of the troublesome ammonio-sulphate cell.

An Optical Experiment.—A correspondent of the "Scientific American" thinks the photographic camera might be a means of gaining an unlimited magnifying power. He would photograph an object and then take a series of enlarged views, each one representing on an enlarged scale, a portion of the preceding one. Evidently he is not accustomed to the use of magnifying powers.

Camphor in Paraffin Lamps.—Mr. John A. Perry, of Liver-

pool, calls attention to the fact that about fifteen grains of camphor added to the paraffin in an ordinary sized lamp about an hour before using, will greatly increase the brilliancy of the light.

Mounting Small Objects in Balsam.— A correspondent in the "English Mechanic and World of Science," who has been troubled by the balsam washing away from the centre of the slide small objects, such as starch grains and diatoms, advises that the balsam be placed on the slide in the form of a ring around the object, so as to run in upon it from all sides and not drift it away. A better contrivance is to wet the object and allow it to dry upon the slide, after which it will not easily be misplaced. A trace of gum arabic may be added to the water if, as will seldom be the case, it should be found necessary.

Bone Dust in Soap.— If any kind of soap seems irritating to the skin, particularly the cheaper kinds of "Old Brown Windsor," try the microscope for the detection of fine particles of ground bone which have not been separated from the fat of which the soap was made.

The Fresh Water Polype. — Mr. James Fullagar gossips pleasantly about the *Hydra vulgaris* in "Science Gossip." He has no difficulty in multiplying his specimens by cutting up the animals; though the parts do not lead an equally favored life, for the head-part proceeds to eat immediately, while the stalk is obliged to wait patiently several hours, fasting, until a new head and tentacles are developed. The polypes contracted and dissolved into a confused mass of granules in December. None could be found during the winter, but very small ones appeared in the spring, and still later these assumed a large size and began to multiply by budding. The earliest that appeared, much smaller than those produced by budding, he believed to be produced from eggs, though their origin escaped him, as it had escaped previous observers.

Reproduction of Sponges.— In a memoir on two New Sponges, etc., in the Annals and Mag. of Nat. Hist., Mr. H. J. Carter remarks that he last year confirmed Prof. H. James Clark's discovery of a "collar" round the cilium of the sponge animal, which must now be regarded as the animal of the sponge, as much as the polype is regarded as the animal of the coral.

The animalcule of the sponges is described, in its passive form, as "a minute globular cell, apparently filled with granuliferous plasma, bearing a nucleus and two contracting vesicles, provided with a rostrum or projecting cylindrical portion supporting a delicate fimbriated collar, in the midst of which is a single cilium, and, in its active state, will take into its body crude material (that is, particles of indigo) if they be presented to it. The collar and rostrum possess the power of polymorphism; and, when necessary, the whole body can be thus transformed. The latter is about $\frac{1}{3000}$ inch in diameter in the calcareous sponges, and only half that size in those of the siliceous ones that I have examined; and they are arranged in countless groups on the living sarcode of the areolar cavities of the sponge." Of other familiar animalcules this resembles most the Difflugia, a kind of Amæba which throws out its pseudopodia from one particular part of its globular form; and if the zygosis among the Difflugiæ is a true conjugation, there is strong reason for believing any similar union of the sponge animalcules to be of the same nature. Though the author does not positively assert that the zygosis of the Difflugiæ is a means of reproduction, he seems inclined to that belief, partly because that procedure is always confined within the limits of species; and he seems to have traced a corresponding link in the history of the sponges.

Finally, the author, having noticed a tendency to speak more decidedly in microscopical inquiries than our powers seem to him to justify, condemns as unphilosophic the usage of those who call the parts of the lower organisms structureless. A wall or layer may be so dense and conspicuous as to be readily observed and named, yet it would be unphilosophic to call it wanting if only infinitely delicate and therefore imperceptible. The leg of Euplotes is "probably" complicated in its muscular structure, and there are textures in the Spongiadæ, he doubts not, which are distant and misty hints of development, which in the higher animals are recognized by the coarsest sense.

Multiplication of Wheel Animalcules by Budding.—Dr. R. Greef has no difficulty in confirming the asexual reproduction of the Vorticellæ by fission, but reaches a very different conclusion in regard to the formation of the budlike structures which he finds are not buds at all, products of their bearer, but the products of

several times repeated fission of other individuals, which attach themselves from without and thus become united to the larger individuals. Stein has already traced this remarkable process and named it gemmiform conjugation. A full discussion of this process is given in the "Annals and Mag. of Nat. Hist." for June, 1872.

Spicules of Sponges. — Dr. J. E. Gray, in treating of the Classification of Sponges, in the "Annals and Mag. of Nat. Hist.," remarks that the order Coralliospongia presents the greatest abundance and the most diversified forms of spicules. The spicules that form the greater part of the skeleton of these sponges are generally joined together by a siliceous substance. Dr. Bowerbank has repeatedly denied this explanation, and calls them siliceo-fibrous sponges; but the perfect form of the spicules and the thin layered additional siliceous deposit which unites them can be well seen in a section, or in a portion of the skeleton disintegrated by the heat of a spirit lamp.

Some sponges have a fashion of collecting and imbedding in their sarcode spicules which are the remains of other sponges; and therefore care is necessary to determine which spicules really belong to the organism in which they are found. Some species even exercise a selection of certain kinds of spicules for this singular kind of absorption.

Though the form and arrangement of the spicules afford important means of classifying the sponges, the external form is an equally important character which cannot be disparaged, as has been done by some distinguished observers. It is true that some of the species are very polymorphous; but the same is true of some algæ and zoophytes which are still classified with some reference to their general forms.

NOTES.

The twin peaks, known as Torrey and Gray's Peaks, the highest of the Rocky Mountains, so far as yet ascertained (being considerably over 14000 feet), were last summer visited by the discoverer, Dr. C. C. Parry, who first ascended and named them in the year 1862, and by the two botanists whose names he gave to them. A full account of the ascent of Gray's Peak, on the 14th of August last, by Dr. Parry, Dr. Gray, and numerous citizens of Georgetown,